

that for low pressures, which mean shallow depths and therefore more or less weathering of the rock, a satisfactory average compressibility cannot be obtained. The seismic compressibility of Sudbury norite, from Leet and Ewing's measurements, is  $1.56 \times 10^{-6}$  which corresponds with a downward extrapolation of the mean of values given above, but this is probably merely a coincidence.

Laboratory data comparable with near-surface seismic data cannot be obtained for loosely consolidated rocks such as some sandstones, shales, etc., by any kind of high-pressure extrapolation because here looseness of mineral bonding plays a large rôle.

**PALEONTOLOGY.**—*The pelecypod genus Vulsella in the Ocala limestone of Florida and its bearing on correlation.*<sup>1</sup> F. STEARNS MAC NEIL, U. S. Geological Survey. (Communicated by W. C. MANSFIELD.)

This paper records from the Eocene Ocala limestone of Florida a new species belonging to the pelecypod genus *Vulsella*. Though well known in other parts of the world, the genus has been nearly unknown in the Americas, in fact, the specimens here described constitute only the second reported occurrence in the western hemisphere. The first record was based on a small specimen of *Vulsella* found living off the Pacific coast of Nicaragua and now in the U. S. National Museum (U. S. Nat. Mus. Cat. No. 101935). Dall<sup>2</sup> made this specimen the type of a new species, *Vulsella pacifica* Dall, though there can be but little doubt that it is identical with a form now inhabiting oriental seas, and that it arrived in the eastern Pacific in comparatively recent times. Commenting on the distribution of the genus *Vulsella*, Dall reported the find as the first known occurrence of the genus in the Americas. His remark may be extended to include the entire family.

The species of *Vulsella* are extremely variable. Of the many Recent forms described as species, probably only three or four are valid. Smith<sup>3</sup> retains four in his revision of the genus, whereas Cox<sup>4</sup> after an examination of a large number of specimens from the Eocene of Somaliland believes that even some genera proposed on the basis of fossils may represent mere individual variations.

<sup>1</sup> Published by permission of the Director of the U. S. Geological Survey. Received April 6, 1934.

<sup>2</sup> DALL, W. H. U. S. Nat. Mus. Proc. 52: no. 2183, p. 403. 1917.

<sup>3</sup> SMITH, E. O. Malacolog. Soc. London Proc. 9: 306. 1910-11.

<sup>4</sup> COX, L. R. Roy. Soc. Edinburgh Trans., pt. 1 (no. 2). 1931.

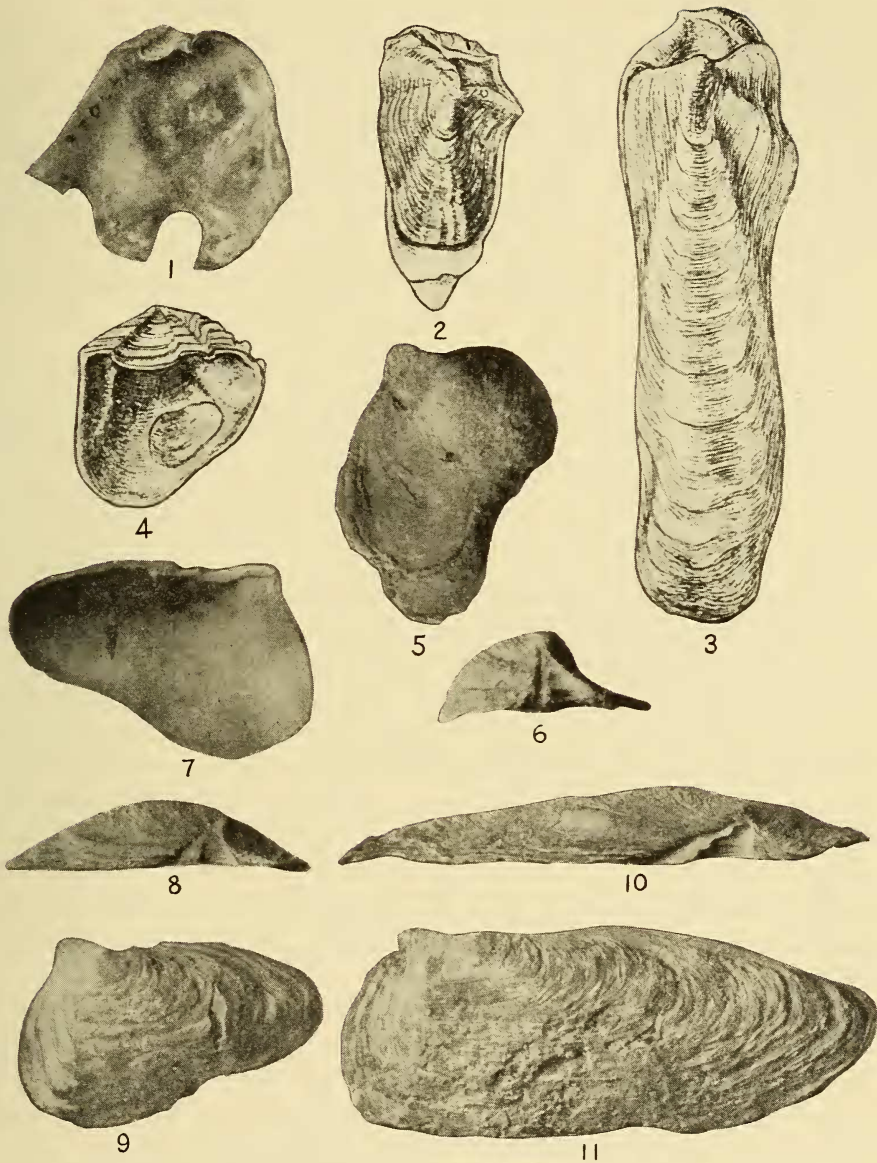


Fig. 1.—*Vulsella deperdita* Lamarek,  $\times 1\frac{1}{2}$ . Calcaire grossier.  
Uilly St. George, Oise, France.

Figs. 2-4.—*Vulsella woodi* Teppner, after Wood. Bartonian. Barton, England.

Figs. 5-11.—*Vulsella ocalensis* Mac Neil, n. sp. 5-6.—Juvenile form,  $\times 3$ . Cotype, 2 miles northeast of Sumpterville, Sumpter County, Fla. 7-9.—Young adult,  $\times 1\frac{1}{2}$ . Paratype,  $1\frac{1}{4}$  miles south of Newberry, Alachua County, Fla. 10-11.—Adult,  $\times 1\frac{1}{2}$ . Cotype, same locality as Figs. 5-6.

There is probably not sufficient material in collections in America to permit a satisfactory systematic study of the species or possible genera of the Vulsellidae. To the writer, however, the suggestion is strong that the Ocala species forms with *Vulsella deperdita* Lamarck<sup>5</sup> (Fig. 1), from the Calcaire grossier of France, and *Vulsella woodi* Teppner<sup>6</sup> (Figs. 2-4), from the Barton beds of England, a small group whose pronounced aviculid characters may warrant separation as a distinct genus.

Deshayes<sup>7</sup> made the following remarks on the peculiarities of *Vulsella deperdita*:

“Elle se distingue de ses trois congénères du bassin de Paris [*V. minima*, *V. angusta*, *V. anomala*] par ses crochets obliques et même divergents, formant dans le jeune âge, un commencement de spire. Le bord de la fossette se détache sous le forme d'une crête tranchante qui suite le mouvement spiral du crochet et l'accompagne jusqu'au sommet.”

The “bord de la fossette” is, more correctly, the posterior dorsal margin of the shell.

The group of *V. deperdita* is the only group of vulsellids in which the posterior dorsal margin remains alate or sub-alate in the adult and, with the exception of the enigmatical *Naiadina herberti* Munier-Chalmas, the only group showing a tendency to anterior inflation or elongation. Furthermore, Recent shells of the genus *Vulsella* consist of vertical prismatic crystals on a thin internal nacreous layer, whereas the new species from Florida has an external layer of very oblique fibro-lamellar elements. The prisms of *V. deperdita* are also oblique to the surface.

The writer believes that the next revision of the Vulsellidae, which should be made from Old World collections, should make use of the differences here pointed out.

Curiously enough, confusion has run riot in the orientation of the shells of the Vulsellidae. We are certainly at a loss to know why Bernard<sup>8</sup> disregarded his own principles of morphology and incorrectly designated the anterior and posterior ends of his fine sketch of an extremely young shell of *Vulsella rugosa* Lamarck. Stoliczka<sup>9</sup> ran aground on the assumption of a byssus. Vaillant<sup>10</sup> readily saw the true axial relations upon the dissection of living specimens of *V.*

<sup>5</sup> DESHAYES, G. P. *Animaux sans vertèbres dans le Bassin de Paris*. Texte II, p. 51. 1864.

<sup>6</sup> TEPPNER, W. *Centralbl. Mineralogie, Geologie, Paläontologie*, 16: 501. 1914.

<sup>7</sup> DESHAYES, G. P. *Op. cit.* p. 51.

<sup>8</sup> BERNARD, F. *Annales sci. nat., Zoologie*. 8th ser., 8: 124, pl. 8, figs. 6, 7. 1898.

<sup>9</sup> STOLICZKA, F. *Palaeontologia Indica*, p. 396. 1871.

<sup>10</sup> VAILLANT, L. *Annales sci. nat., Zoologie*, 5th ser., 9: 284. 1868.

*rugosa* Lamarck, and Fischer follows him in his *Manuel de Conchyliologie*. Munier-Chalmas<sup>11</sup> and Douville<sup>12</sup> seem to be in correct accord over Recent forms and fossils most nearly related to them, but the anterior marginal inflation of *Vulsella deperdita* Lamarck they confused with the posterior marginal notch of certain Recent and fossil forms.

The new species offered in this paper may be described as follows:

*Vulsella ocalensis* Mac Neil, n.sp.

Figures 5-11

Shell sub-ostreiform, anteriorly inflated and elongate, thin except at umbo, where it is thickened or camerate; exterior shell layer composed of oblique fibro-lamellar elements, inner layer laminar and compact, probably nacreous, but possibly laminar calcitic; adult sculpture roughly concentric; umbo sub-spiral and opisthogyrate; posterior dorsal margin sharply alate and following the rotation of the beak; ligament area depressed, acute and posteriorly directed in extremely young shell but becoming wider and more anterior in adult; ligament area containing a single deep ligament pit, at first directed posteriorly along the hinge line but swinging anteriorly with the widening of the ligament area; muscle scar just anterior to the beak and close to the ventral margin; anterior ventral corner of ligament area forming a toothlike projection on the otherwise edentulous hinge line.

All of the types are right valves.

Dimensions of larger cotype: length 48 millimeters, height 19 millimeters, convexity 7 millimeters.

Type localities: Cotypes (U. S. Nat. Mus. Cat. No. 373052), Sumpter Rock Co. quarry, about 2 miles northeast of Sumpterville, Sumpter County, Fla. (U. S. G. S. Sta. No. 12751); collectors: W. C. Mansfield and G. M. Ponton, 1932. Paratype (U. S. Nat. Mus. Cat. No. 373053), Cummer Lumber Co., 1¼ miles south of Newberry, Alachua County, Fla. (U. S. G. S. Sta. No. 6812); collector: C. W. Cooke, 1913.

The point of greatest interest in the new Ocala species is the fact that it provides what is probably as good a criterion as any now known for trans-Atlantic correlation. *Vulsella woodi* from the Bartonian and *Vulsella ocalensis* from the Ocala limestone, both rare but intimately related species with a limited geologic range, are not clearly related to any other species of *Vulsella* except their probable prototype, *Vulsella deperdita* from the Calcaire grossier.

A very striking series is seen as we pass from the ventrally elongate, sub-alate *Vulsella deperdita* through the intermediate *Vulsella woodi* to the anteriorly elongate, conspicuously eared *Vulsella ocalensis*.

<sup>11</sup> MUNIER-CHALMAS, M. Linnean Soc. Normandie Bull. 8: 100. 1863.

<sup>12</sup> DOUVILLÉ, H. *Étude sur les Vulsellidés*. Annal paléontologie. 2: 1907.